

# **Energy Efficiency and Colorado Utilities:**

## **How Far We've Come; How Far We Need to Go**



## **Public Utilities Commission**

**October 20, 2009**

## Executive Summary

In November 2007, Governor Ritter announced the Colorado Climate Action Plan (CAP), setting carbon reduction goals for the state and describing action steps for all segments of the energy economy<sup>1</sup>. The CAP calls for reducing carbon dioxide emissions by twenty percent (from 2005 levels) by the year 2020. The CAP also proposes that Colorado achieve half of the carbon reductions through energy efficiency. Of the total energy efficiency goal, the CAP estimates that forty-one percent will be achieved through demand-side management (DSM) programs. This means that energy efficiency will be one of the most important responses to the carbon-reduction challenge.

**All electric market segments – investor-owned, municipal and cooperative – must carry their share of the responsibility for utility-sponsored energy efficiency investments if Colorado is to meet the CAP goals. Currently there are significant gaps between proportionate shares and DSM goals.**

As of fall 2009, all investor-owned gas and electric utilities in Colorado are implementing PUC-approved DSM programs. Their efforts form a solid foundation, putting these companies on a path to meet the ambitious 2020 energy efficiency and carbon reduction goals. For Public Service Company and Black Hills Power, the DSM programs mean that, within a few years, electric demand growth for these utilities will be cut by more than one-percent per year. Investor-owned gas utilities are also making marked progress toward their energy-savings goals.

The electric DSM efforts in the rest of Colorado have been uneven. The Fort Collins municipal utility is implementing DSM at a level to achieve its portion of the CAP goal. The Colorado Springs municipal utility is implementing significant DSM programs and is planning to expand its DSM efforts in the future. Currently, nearly all of the electric coops are implementing various DSM programs. . Tri-State Generation and Transmission (G&T), as the wholesale supplier to 18 of Colorado's rural electric associations (REAs or coops), is providing additional support for energy efficiency measures promoted by its member co-ops which cover much of rural Colorado. Tri-State is also undertaking a comprehensive study of DSM potential for the service areas of its

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<sup>1</sup> [http://www.colorado.gov/energy/in/uploaded\\_pdf/ColoradoClimateActionPlan\\_001.pdf?wwparam=1250633068](http://www.colorado.gov/energy/in/uploaded_pdf/ColoradoClimateActionPlan_001.pdf?wwparam=1250633068)

members; the study is expected to be completed early next year. The non-investor-owned utilities, given the nature of their business model, are confronted with the challenge of determining how to best incorporate the benefits of DSM in resource planning. What is clear is that this portion of the state's total electric market needs to be incorporated into a comprehensive statewide DSM strategy. The crux of the issue is this: how does the state build upon the Coop and Municipal utilities' efforts to achieve carbon reduction savings consistent with the CAP? Also, what public policy best promotes carbon reduction in these sectors?

**New energy efficiency initiatives, including those funded by the federal Recovery funds, share similar objectives with utility DSM programs. Coordination between these efforts is critical to their short and long term success.**

There are several challenges on the horizon that could impede the utility DSM performance needed to meet CAP goals and fully integrate DSM into statewide electric resource planning. One significant challenge for utility DSM programs is how to respond effectively to the infusion of energy efficiency funding from the American Recovery and Reinvestment Act (ARRA) and the corresponding programs being developed by the Governor's Energy Office (GEO) across all market segments. There are significant opportunities to leverage the ARRA resources. How that is done will directly impact the long-term success of DSM efforts in Colorado. The issue is how utility DSM and ARRA initiatives coordinate their efforts.

**The Commission will assure that its rules encourage maximum coordination between the utility programs and the GEO-ARRA initiatives.**

From the PUC's regulatory perspective, the infusion of the ARRA-funded initiatives highlights the issue of how the utilities should adjust their spending of ratepayer funds to support DSM. Substantial coordination is called for, not only to make effective use of ratepayer funds but also to fully leverage the ARRA resources so that we create an effective DSM infrastructure for the post-ARRA period.

**Lessons learned from other states can inform our efforts to accomplish market transformation in our energy efficiency efforts in Colorado.**

The marketplace in which DSM programs operate is changing, due mainly to ARRA initiatives, new laws, and changing consumer behavior. New appliance standards, establishing higher minimum energy efficiency levels, will significantly affect consumer choices within a few years. Building energy codes will affect the baseline efficiency of new and remodeled homes and commercial buildings, pushing up the efficiency level that is minimally acceptable in homes and buildings. Legislation will likely phase-out the manufacture of incandescent bulbs. These dynamic forces compel DSM planners to rethink the approaches to influencing consumer behavior. More generally, we need to reexamine overall strategies for achieving energy savings. Focusing primarily upon financial incentives to customers (rebates) may no longer be sufficient.

**All players – utilities, regulators, GEO, and other partners – must collaborate on all aspects of energy efficiency program delivery – design, outreach, marketing, administration, and evaluation – in order to ensure the success of the joint efforts.**

The components of a comprehensive, statewide, energy efficiency strategy are becoming clear. So are the challenges. As each utility implements its DSM plan and GEO rolls out its portfolio of initiatives, the energy efficiency marketplace could become rather crowded and confused, to the detriment of our common energy efficiency objectives. We need a clear and consistent public message, combined with well-designed programs that leverage the best each party has to offer.

Based on DSM progress to date and anticipating changes in the energy efficiency marketplace, this paper presents a series of recommended actions directed toward: (1) regulated utilities, as they prepare subsequent DSM applications; (2) key stakeholders in statewide energy efficiency initiatives, such as the Governor's Energy Office; (3) the State Legislature, who request that the Commission recommend statutory changes for DSM (*see* 40-3.2-105, C.R.S.); and (4) the Commission itself. Together, we think these actions will keep Colorado on track to achieving the energy efficiency goals of the Governor's Climate Action Plan, to the benefit of all Coloradans.

## **The Colorado Climate Action Plan and Energy Efficiency**

In November 2007, Governor Ritter released the Colorado Climate Action Plan (CAP)<sup>2</sup>, setting forth carbon reduction goals for the state and action steps for various segments of the energy economy. The CAP calls for reducing carbon dioxide emissions by twenty percent (from the 2006 level) by the year 2020. The CAP also proposes to achieve half that goal through energy efficiency improvements.

The CAP also outlines the potential that various sectors can contribute to the energy efficiency goal, identifying five energy efficiency strategies:

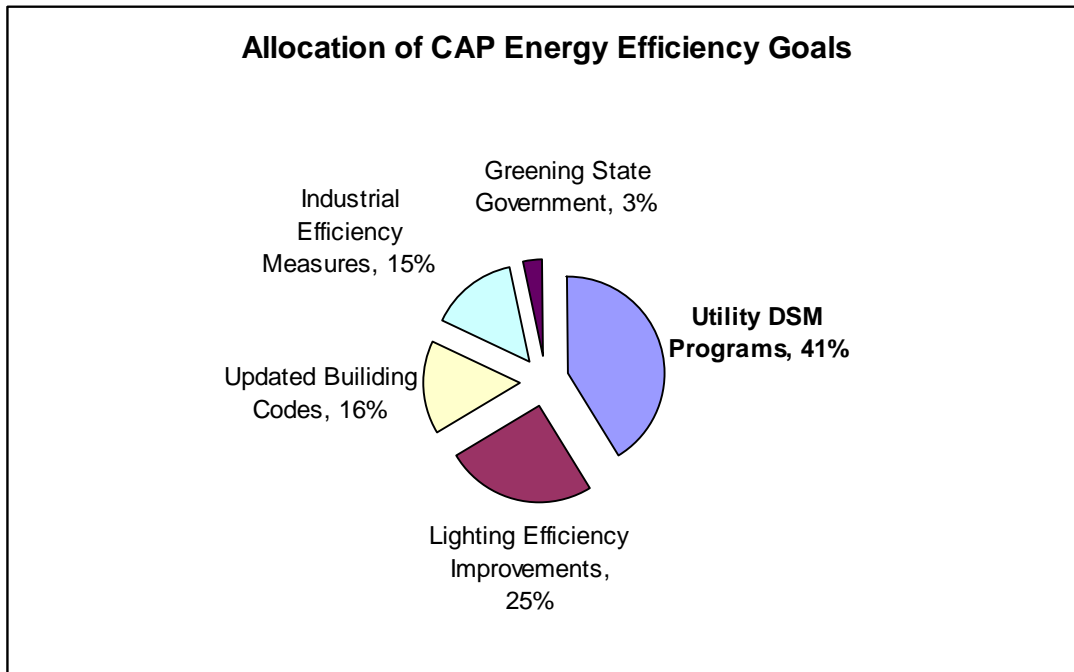
- ❖ Utility Demand-Side Management (DSM) Programs:
  - Utility-funded financial incentives, designed to delay or avoid investments in new electric generation
- ❖ Lighting Efficiency Improvements
  - Expanding the use of highly efficient light bulbs and lighting applications in homes, institutions and businesses
- ❖ Updated Building Energy Codes
  - Working from a statewide baseline established by the 2007 legislature, continue to incorporate technical advancements into the local codes
- ❖ Industrial Efficiency Measures
  - Initiatives by large retail customers to substantially reduce their electric consumption
- ❖ Greening State Government
  - A “lead by example” strategy aiming at the various ways that the State consumes energy, particularly in buildings and vehicles

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<sup>2</sup> [http://www.colorado.gov/energy/in/uploaded\\_pdf/ColoradoClimateActionPlan\\_001.pdf?wwparam=1250633068](http://www.colorado.gov/energy/in/uploaded_pdf/ColoradoClimateActionPlan_001.pdf?wwparam=1250633068)

The energy efficiency component of the CAP (50% of the total goal) is allocated among the five strategies above. Utility DSM is called upon to carry the largest portion, as shown in this chart:

Chart 1



The messages of the CAP are clear: (1) energy efficiency is a critical part of a successful carbon reduction strategy; and (2) the expectations of the utilities are substantial.

Because most of the energy efficiency goal is assigned to utility DSM programs, and because most of Colorado's utility business is regulated by the PUC, the Commission has a critical role in the successful implementation of the CAP.

**This paper assesses DSM progress toward the CAP goal, identifies challenges ahead and outlines recommended actions in response to these challenges.**

## **Utility DSM in Colorado: PUC Implementation of HB 07-1037**

In 2007 the Colorado General Assembly passed and the Governor signed House Bill 07-1037.<sup>3</sup> HB 07-1037 is the cornerstone of utility-initiated energy efficiency efforts in the state. The new law establishes minimum energy efficiency targets for the state's regulated utilities and requires and empowers the Colorado Public Utilities Commission (PUC) to bring about substantial and effective DSM programs.

Following the enactment of HB 07-1037, the PUC established a framework within which DSM programs operate. The Commission has reviewed and approved DSM plans for all investor-owned energy utilities in the state. Here are the milestones in the implementation of HB 1037:

- ❖ March 2008: Commission adopts Gas DSM rules; (rules took effect June 2008).
- ❖ May 2008: a Commission Order outlines specific DSM goals, defines the financial incentives and determines the planning timetable and implementation parameters for Public Service Company of Colorado's (PSCo's) Electric DSM Planning.
- ❖ December 2008: PSCo's Combined Electric and Gas DSM Plan is approved by the Commission; (implementation began in January 2009)
- ❖ December 2008: 3 Gas DSM Plans approved by the Commission; (Atmos Energy; Colorado Natural Gas; and SourceGas); implementation began in January 2009.
- ❖ April 2008: Black Hills Energy's (BHE) Gas DSM Plan approved by the Commission; implementation began in May 2009.
- ❖ May 2008: BHE's Electric DSM Plan approved by the Commission; Eastern Colorado Utility's Gas DSM Plan approved by the Commission; implementation began in July 2009.

**With these actions, the PUC put in place a framework for ambitious and effective DSM programs, and all regulated utilities are implementing their PUC-approved DSM plans.**

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<sup>3</sup> To read the legislation as enacted, go to:  
[http://www.leg.state.co.us/clics/clics2007a/csl.nsf/fsbillcont3/5EA2048E8A50B21287257251007B8474?open&file=1037\\_enr.pdf](http://www.leg.state.co.us/clics/clics2007a/csl.nsf/fsbillcont3/5EA2048E8A50B21287257251007B8474?open&file=1037_enr.pdf)

## **Utility DSM Targets Relative to the Climate Action Plan Goal**

As noted above, the CAP identifies as one solution for utilities to achieve 41% of the total energy efficiency goal through Demand-Side Management (DSM) programs. This aggregate goal applies to all utilities in the state, the investor-owned utilities regulated by the PUC as well as municipally-governed utilities and rural electric cooperatives.<sup>4</sup>

The Governor's Energy Office (GEO) analyzed the CAP to determine what quantity of DSM needs to occur to achieve the avoided CO<sub>2</sub> expected from DSM. GEO concluded that statewide 6,725 Gigawatt-hours (GWh) of electricity would need to be avoided through DSM by 2020 in order for DSM to meet its portion of the 2020 carbon reduction goal. If the 6,725 GWh goal was attributed to utilities throughout the state based upon their relative share of the total electricity sales in the state, then the following chart would outline the necessary reductions by the utilities.

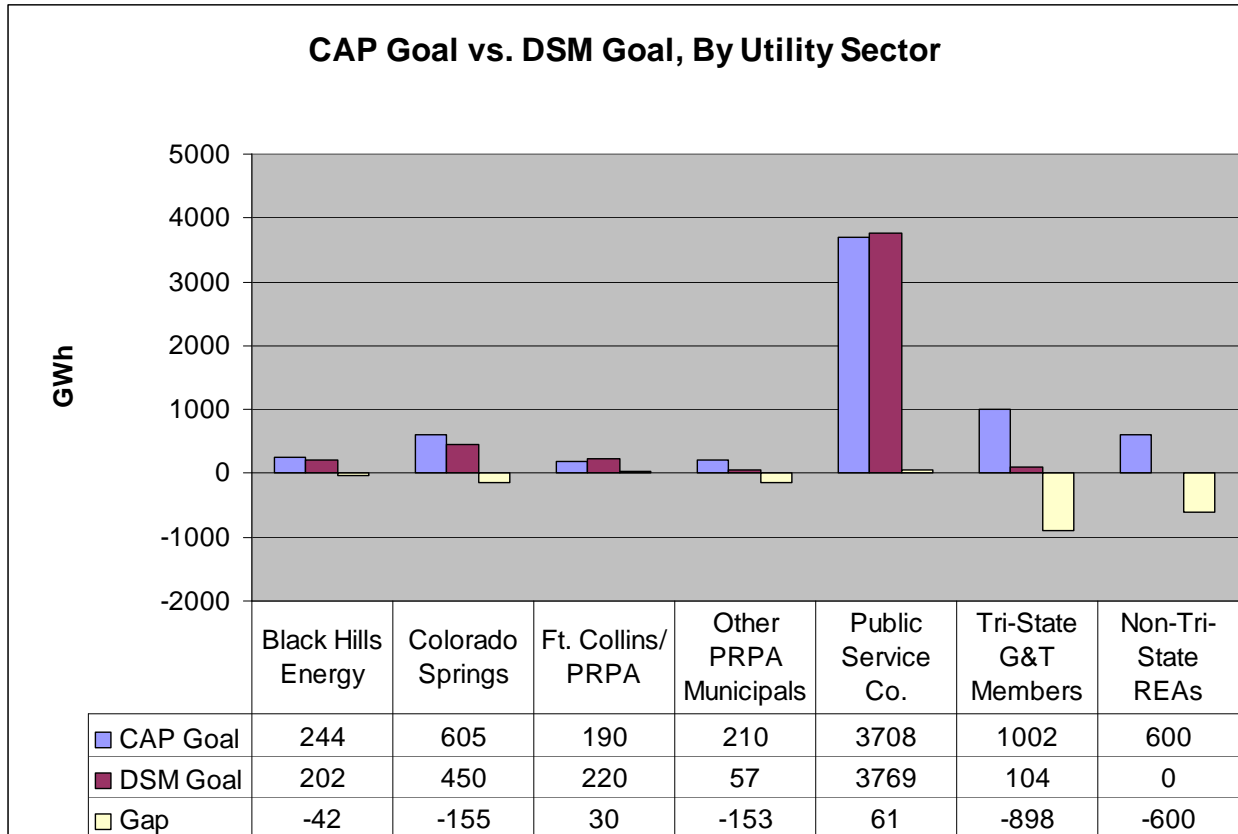
The chart below presents the GEO calculations and current DSM commitments for the largest electric utilities in the state.

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<sup>4</sup> It is noted that while the CAP calls for utilities to achieve carbon reductions through DSM, equal or greater utility carbon reductions could be achieved through other means, such as by reducing the proportion of high carbon emitting generation in a utility's portfolio.



Chart 2



(Data and further narrative supporting Chart 2 is presented in Appendix A.)

It is important to note that the business model of Tri-State and rural co-ops offers unique challenges concerning the pursuit of DSM. The relationship between Tri-State and its members is horizontally structured, not vertically structured. Tri-State owns the generation and transmission, but does not interact with the source of the demand – the consumers. The member coops interact with the consumers and aggregate the demand into a purchase from Tri-State, yet, the coop does not have generation assets as part of its business. This structure creates challenges for DSM program design. In addition, each of Tri-State’s 18 Colorado Member Systems has different load profiles and unique membership situations that do not lend themselves to one-size-fits-all programs.

The Commission also acknowledges that rural electric associations (REAs or “co-ops”), as the purchasers of wholesale power and distributors to retail consumers, have limited financial

incentives to promote DSM. The avoided cost benefits of DSM (primarily the deferral or avoidance of investing in new generation resources) affect the co-op by potentially reducing the cost of future wholesale purchases, and with no guarantee that the benefit will accrue to the co-op after factoring in fixed cost recovery and debt servicing.

Utility DSM programs are very cost effective investments. Based only on the DSM plans of Public Service, Black Hills Energy, Colorado Springs and Fort Collins municipal utilities, it is estimated that nearly \$1.6 billion must be invested in utility efficiency programs during 2007-2020 (net present value in 2007 dollars) in order to achieve the CAP level of energy savings. In contrast, these measures would yield nearly \$3.2 billion in net economic benefits over their lifetime, again NPV in 2007 dollars.<sup>5</sup> It is likely that energy efficiency programs implemented by Tri-State and/or rural electric co-ops would have similar economic benefits; however, cost of deployment and difficulty in attaining energy savings in rural areas where there are few metropolitan centers of concentration to build from likely will be substantially higher than in more urbanized areas.

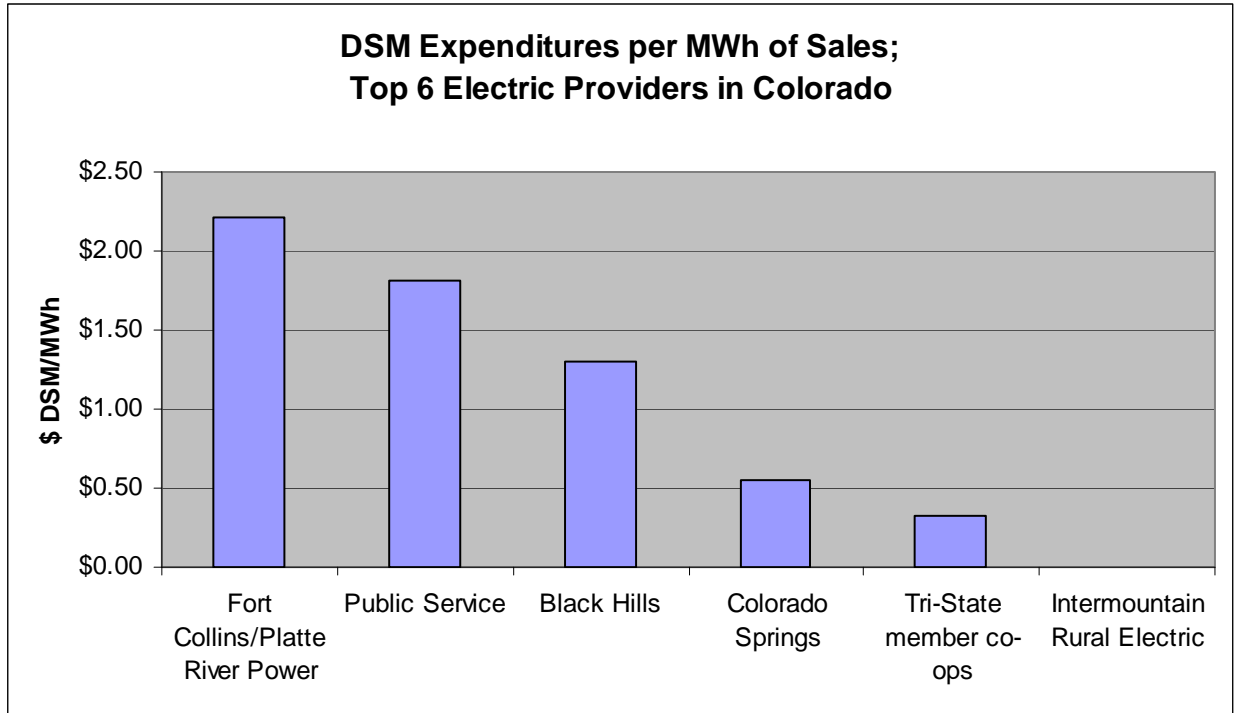
This situation raises a significant issue concerning the pursuit of long-term, statewide DSM goals. **The crux of the issue is this: if the portion of the state served by co-ops is to carry its proportionate share of the CAP DSM goal, who in the delivery chain should take the lead in funding and implementing these programs?**

Chart 3 was developed using 2007 total sales data from the DOE Energy Information Administration and DSM budget data available from each utility. This chart presents a “level playing field” way to compare current utility DSM commitments across utilities, by comparing each utility’s commitment (measured in dollars of total DSM budget) to the utility’s total (retail) electric sales.

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<sup>5</sup> Report to GEO by the Southwest Energy Efficiency Project (SWEET); 8-25-09. The economic analysis is based on the estimated cost effectiveness of Xcel Energy’s 2009-2010 DSM programs.

Chart 3



Notes:

- These top 6 providers of electricity (including aggregation of 18 cooperatives who are retail members of Tri-State) represent 90% of all electric sales.
- MWh sales data from U.S. DOE Energy Information; 2007 sales (<http://www.eia.doe.gov/cneaf/electricity/esr/table10.xls>)
- DSM budget data is for the 2009 program year.

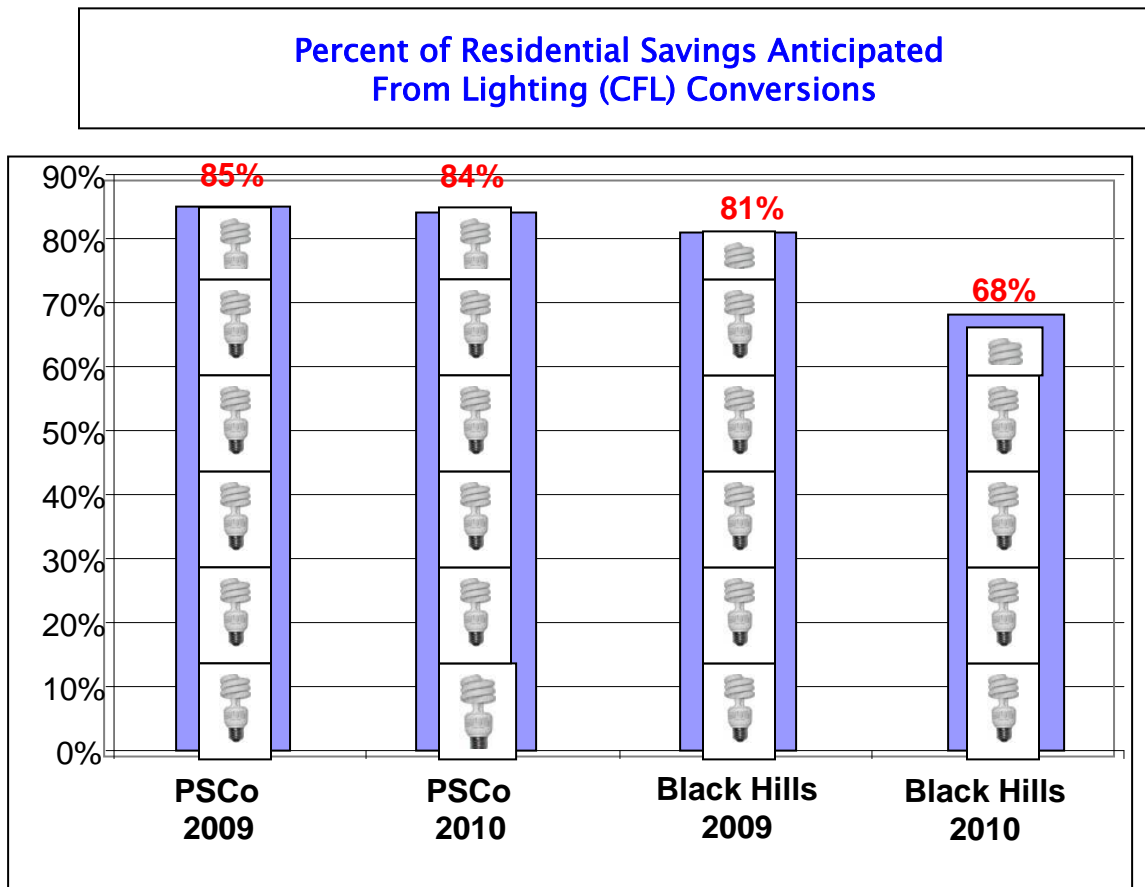
# On the Horizon: Policy and Technology Changes Impacting DSM

While Colorado DSM activity is making strides toward achieving its 2020 goals, there are various anticipated changes that could affect these efforts.

## Federal Lighting Efficiency Standards

The Energy Independence and Security Act of 2007 (EISA) addresses lighting efficiency. Specifically, this law sets minimum efficiency standards for light bulbs, starting in 2012 and ratcheting upward through 2020. The electric DSM plans approved by the PUC rely substantially upon lighting efficiency, especially in the residential sector, to achieve the DSM goals, as shown in this chart:

Chart 4



## **ARRA Funded Initiatives in Colorado**

In May 2009 GEO outlined its “Strategic Goals and Objectives” for the State Energy Program portion of the American Recovery and Reinvestment Act (ARRA) funding awarded to Colorado.<sup>6</sup> Several of the GEO initiatives will target the same energy end uses addressed by utility DSM programs. The table below matches ARRA-funded energy programs with the related utility DSM programs.

A portion of the American Recovery and Reinvestment Act (ARRA) funds are earmarked for rebates to consumers who buy energy efficient (ENERGY STAR) appliances. In Colorado’s ARRA application to the Department of Energy (to be submitted in mid-October 2009), several of the targeted appliances will likely be same appliances currently targeted through utility DSM rebates. Examples are space heating and cooling, water heating and refrigerators. GEO and the electric and gas utilities are working to coordinate program design and implementation. The ENERGY STAR rebates, scheduled to be in the market in the first quarter of 2010, will be a challenge both for 2010 DSM programs where rebate levels have already been set, as well as for 2011-2012 program planning. This highlights the need to balance regulatory objectives (assuring that ratepayer funded DSM is cost-effective) with ARRA objectives (stimulating economic activity through energy efficiency investments).

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<sup>6</sup> [http://www.colorado.gov/energy/images/uploads/pdfs/GEO\\_ARRA\\_Program\\_Goals\\_and\\_Objectives.pdf](http://www.colorado.gov/energy/images/uploads/pdfs/GEO_ARRA_Program_Goals_and_Objectives.pdf)  
Page 12 of 25

Chart 5

GEO/ARRA Initiative	Possible Companion DSM Program(s)
<p><u>Existing Home Residential Energy Efficiency</u>: rebates for insulation, duct sealing, air sealing, lighting, and an energy audit subsidization. Incentives will be bundled into a “whole house tune-up.”</p> <p><u>ENERGY STAR appliance rebates</u>: Rebates for clothes washers, dishwashers, refrigerators, water heaters and heating systems</p>	<ul style="list-style-type: none"> <li>- <u>Residential energy audit programs</u> (electric and gas): subsidized service</li> <li>- <u>Heating appliance rebates</u> (gas)</li> <li>- <u>Appliance rebates</u> (electric and gas): cooling; water heater; refrigerator</li> <li>- <u>Insulation rebates</u> (gas)</li> <li>- <u>Lighting rebates</u> (electric)</li> <li>- <u>Home Performance with ENERGY STAR</u> (electric and gas): “whole-house” approach to delivering energy efficiency incentives</li> </ul>
<p><u>Energy Codes</u>: adoption and enforcement of latest energy codes by local jurisdictions</p>	<p><u>ENERGY STAR New Homes Program</u>: encouraging construction to standards above code. (PSCo)</p>
<p><u>Existing Commercial Buildings</u>: energy performance contracting services, energy management expertise and efficiency upgrades; targeting specific market segments (publicly owned properties; relatively small energy consuming properties)</p>	<p>(PSCo electric/gas DSM offerings)</p> <p><u>Recommissioning</u>: review of existing equipment and systems; cost-effectiveness analysis of energy savings investment opportunities</p> <p><u>Self-Directed Custom Efficiency</u>: targeting large commercial/industrial customers; customers receive project-specific rebate amounts for engineering, implementing and commissioning qualifying projects.</p>
<p><u>High Performance Buildings</u>: technical assistance to public agency new construction and major renovation projects; workshops, trainings and dissemination and development of tools and best practices.</p>	<p><u>New Construction Program – Energy Design Assistance</u>: provides assistance to architects free of charge, to offset the cost of enhanced energy analysis during the project development process. (Black Hills and PSCo electric/gas DSM offering)</p> <p><u>New Construction Program – Energy Efficient Buildings</u>: a scaled-down approach for smaller commercial buildings. (PSCo)</p>

### **ARRA and Low-Income DSM in Colorado**

All PUC-approved DSM plans (gas and electric) contain programs targeted to the low-income segment of the residential market. The programs range from single-family comprehensive energy efficiency services (“weatherization”) to targeted weatherization services (multi-family and non-profit properties) and the distribution of “kits” containing self-installed energy efficiency devices and educational materials. Many of these DSM services, particularly the single-family weatherization, are already delivered using the same delivery infrastructure that GEO uses to deliver federally-funded Weatherization Assistance Program (WAP) services. One near-term challenge for the GEO-utility coordination is to determine the most effective use of each party’s resources in light of the substantial increase in WAP funding being received by the state.<sup>7</sup> That does not include anticipated increases in the Low-Income Home Energy Assistance Program (LIHEAP) funding, a portion of which can also be used for weatherization services.

The coordination issue raised here is similar to the earlier discussion. In this case, though, the numbers are much larger, with the ARRA weatherization funding representing a five to ten-fold increase in the program (depending upon how quickly the funds are disbursed). Once again, these facts call for ongoing and creative coordination between GEO and the utility DSM programs, seeking to find a balance between the economic objectives of the ARRA funding and the best interests of the ratepayers who are funding utility DSM programs. Here the GEO-utility working relationship has already been established, since all utilities have been partnering with GEO (at least in part) to deliver energy efficiency services to low-income households.

**The challenge is this:** unlike the other utility DSM-ARRA intersections where the utility funds still dominate, the magnitude of the ARRA funding for low-income weatherization calls into question the best use of utility low-income DSM funds. The decisions made concerning 2010 and beyond need to balance short-term regulatory concerns with the prospect of creating a more comprehensive and effective delivery infrastructure, one designed to be sustainable after ARRA funding ends.

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<sup>7</sup> \$32 million has just been received; and a total of \$79 million is anticipated. All of this is slated to be expended over the next 2-3 years. This compares with an annual receipt of about \$5 million from DOE prior to ARRA.

## **Innovative Financing of Energy Efficiency Investments**

In the DSM plans filed with the PUC, Colorado utilities identified various market barriers to consumer participation, and presented mitigation strategies for overcoming such. Possibly reflecting that 2009-2010 DSM plans were prepared prior to the current economic recession, their discussion of market barriers does not discuss inadequate access capital on the part of commercial or residential customers.

More recently various utility DSM staffs have reported informally that the economic recession is adversely impacting consumer investments in energy efficiency. DSM investments by commercial customers are competing against other investments for limited capital resources. Residential customers appear to be rethinking all discretionary expenditures, regardless of the return-on-investment potential.

Emerging during these recessionary times are a variety of strategies aimed at making capital more available and under more favorable terms. Colorado-specific examples of such are discussed below.

HB 08-1350 established residential and commercial financing mechanisms through local governments and the Colorado Clean Energy Development Authority for energy efficiency retrofits and improvements. Since its enactment, Boulder County has established the ClimateSmart Loan Program. At least three other ballot measures are anticipated this November to enact similar programs in Eagle, Gunnison and Pitkin Counties.

SB 08-184 empowered GEO to establish the Colorado Clean Energy Finance Program. GEO is the program overseer and the State Treasurer is authorized to invest in bonds or notes in support of loans issued by the Program. GEO is currently establishing the program details.



Also under discussion is a GEO partnership with one or more financial institutions to provide energy efficiency mortgage financing. The concept calls for incorporating household utility expenses into the total loan eligibility calculation, which traditionally includes principle, interest, taxes and insurance (PITI). The objective is to provide financing to homeowners that yields no net increase in PITI plus utilities, due to the effectiveness of the energy efficiency investments and the loan rate offered.

As utilities prepare 2011-2013 DSM plans their updated review of market barriers will likely indicate a continued lack of adequate financing in both the commercial and residential sectors. Redirecting DSM resources toward this market barrier may be more cost effective than providing rebate-based incentives. The various initiatives underway in Colorado offer opportunities for utilities to address this market barrier in a shared risk approach, to the benefit of all participants.

### **ARRA and Public Outreach**

GEO is also allocating a portion of ARRA State Energy Program funds for Public Information and Consumer Outreach. The general objective of this effort is to coordinate information regarding the myriad energy-related incentives available across the state, from utility and local governmental sources. GEO envisions coordination occurring through such efforts as a centralized source (phone, website, etc.) for consumers to access information about energy efficiency programs, and related program and message coordination as well as customer data sharing. Each PUC-approved utility DSM plan contains marketing strategies and resource commitments aiming at similar objectives. Thus, this offers another area for GEO-utility coordination, with the potential for significantly increasing participation utility DSM programs.

Currently three gas utilities (Atmos, Colorado Natural Gas and SourceGas) are collaborating in their marketing of gas DSM and related customer interactions. (See [www.excessisout.com](http://www.excessisout.com).) Such efforts are applauded, and provide the groundwork for expanding energy efficiency coordination statewide.

Without coordination the ARRA-funded initiatives slated to soon enter the market could actually work against increased participation if consumers are confused about who to trust and what options are available. To this point, electric and gas utilities are working with the Governor's

Energy Office to insure a coordinated plan on energy efficiency efforts between utilities and the GEO. The crux of the confusion will be the increased number of messages that consumers will receive concerning energy efficiency and financial incentives. GEO is aware of this and is responding creatively with its proposal to coordinate the information flow and consumer interactions. The success of this venture will require active utility and key stakeholder<sup>8</sup> support, resolving issues such as co-branding; message coordination; and sharing customer data.

Also, while the GEO-utility coordination efforts are in their early stages, it would benefit long-term effectiveness if the non-regulated DSM programs were included in the planning and development efforts. These are primarily located along the Front Range, most significantly being the Ft. Collins and Colorado Springs municipal utilities.

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<sup>8</sup> One group of key stakeholders needing to be involved is those entities currently conducting outreach to low-income energy consumers: Energy Outreach Colorado and the State Low-income Energy Assistance Program (LEAP).

## CAP Non-Utility Initiatives Affecting the Energy Efficiency Market

As the CAP indicates, significant energy savings are expected from policies and programs other than utility DSM programs. Four specific strategies are identified in the CAP: federal appliance and lighting standards; updated building energy codes; a statewide industrial energy efficiency program that will be launched in the fall of 2009; and Greening State Government. The following data and explanation is presented to further highlight the fact that DSM is operating within a very dynamic marketplace with several initiatives simultaneously targeting energy usage reduction.

The table below summarizes the energy savings that the Southwest Energy Efficiency Project (SWEET) estimates will occur by 2020 due to these efforts, concerning three of the four strategies listed above.

Chart 6

Policy	Electricity savings in 2020 (GWh/yr)	Gas savings in 2020 (million Dtherms/yr)	Avoided CO <sub>2</sub> emissions in 2020 (MMT)	Anticipated Net Economic Benefits (Present Value; 2007 \$)
Updating building energy codes	1,671	10.29	2.09	\$1.25 billion
Federal lamp standards	4,379	--	4.03	\$1.25 billion
Industrial challenge program	709	12.5	1.32	\$924 million
<b>TOTAL</b>	<b>6,759</b>	<b>22.79</b>	<b>7.44</b>	<b>\$3.424 billion</b>

Notes:

1: Does not include energy savings from other statewide programs funded under ARRA.

2: Avoided CO<sub>2</sub> emissions are from both electricity and natural gas savings.

3: The Industrial Challenge data has been adjusted to avoid double counting of savings from utility DSM programs.

Data source: Southwest Energy Efficiency Project (SWEET) analysis conducted on behalf of GEO. Data is not available concerning the Greening State Government strategy.

More detail regarding these initiatives is presented in Appendix B. This information is included to identify that the energy efficiency marketplace is very dynamic and that the assumptions underlying 2009-2010 DSM plans will likely be invalidated by the initiatives listed above.

## **Responding to the Changing Conditions: Lessons from Other States**

DSM program planning is already responding to the federal lighting changes, in anticipation of this impact upon the market beginning in 2012. With the assistance of the Southwest Energy Efficiency Project (SWEET), information has been gathered concerning DSM program planning in Nevada and Arizona. (See Appendix C.) These examples demonstrate how regulated, investor-owned utilities are proactively adjusting DSM portfolios, shifting away from a heavy emphasis on residential lighting retrofits while increasing energy savings goals.

Nevada Power Co.<sup>9</sup> is ramping up DSM toward a goal of saving about 1.3% of its sales in 2010 and 2011. In 2012 the utility still expects to save about 1.0% of its sales with a DSM portfolio that will no longer provide incentives for using CFLs.

The most recent Arizona Public Service (APS) DSM plan calls for continued growth in DSM goals, from 1.0% of sales in 2010 to 1.5% in 2012. CFL incentives are a part of the APS portfolio, in diminishing amounts with each subsequent year.

The California Public Utilities Commission, (CA-PUC) and the electric and gas utilities it regulates, continue to demonstrate leadership in the transformation of DSM from primarily rebates to market transformation (MT) strategies. MT pertains to strategies designed to change market behavior to a degree where incentives are not necessary to achieve the desired energy efficiency practices. These strategies place an emphasis on underlying factors impeding adoption of the desired behaviors, such as a lack information or training among those most able to impact the market. One example is the training of building code officials in energy building code implementation and compliance.

As a DSM strategy, MT is more challenging to quantify, concerning the metrics underlying DSM: energy savings and cost effectiveness. Yet, quantitative studies such as those referenced in Appendix C are showing that it is possible. These efforts are making it feasible to consider

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<sup>9</sup> The examples of DSM portfolio adjustments from other states are illustrative of utilities responding to changing market conditions, acknowledging that each state has unique market characteristics.

incorporating MT strategies into DSM portfolios, not as “indirect” components but as integral parts of the portfolio, performance plan and incentive calculations.

In September 2009 the CA-PUC issued a decision that outlines a new approach to including MT within DSM portfolios<sup>10</sup>. The decision establishes a process for determining MT metrics, for use in measuring the impact of MT strategies. As stated in the decision, “market transformation metrics require the identification of indicators to track, the identification of data sources, and agreement on the frequency of data collection, analysis and use.”<sup>11</sup>

While Colorado does not have the breadth and depth of DSM experience underlying California’s approach to DSM, the Colorado PUC and regulated utilities can benefit from the California experience to accelerate the evolution of DSM. California and other DSM benchmark states are incorporating MT strategies as a measureable and significant component of DSM portfolios. The challenge is for Colorado to respond to the market changes identified in this report by bringing MT strategies more centrally into DSM portfolios.

### **Rate Design as an Energy Efficiency Strategy**

Utilities in several states are using rate design to encourage the efficient use of energy by consumers. The Commission recently investigated this topic in Docket 08I-420EG.<sup>12</sup> One conclusion of that investigation was that tiered (inverted block) rate design for residential customers, and time-of use rate design should be pursued further in subsequent dockets, such as a Phase II electric rate case proceeding. The Commission has an open docket before it<sup>13</sup> within which such rate designs have been proposed. Thus, the Commission is not at liberty to discuss the merits of such rate designs, other than to articulate that **encouraging the efficient use of energy is an appropriate objective of rate design.**

**The experiences of other states highlighted above represent various strategies that could be effective in Colorado, in response to the market dynamics affecting DSM indicated in this paper.**

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<sup>10</sup> *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets*  
[http://docs.cpuc.ca.gov/PUBLISHED/AGENDA\\_DECISION/107378.htm](http://docs.cpuc.ca.gov/PUBLISHED/AGENDA_DECISION/107378.htm)

<sup>11</sup> See section 4.6.3.3 of the Decision, “Process for Developing Market Transformation Metrics”

<sup>12</sup> In the Matter of the Investigation of Regulatory and Rate Incentives for Customers of Gas and Electric Utilities; See Decision No. C08-0988.

<sup>13</sup> Docket 09AL-299E

## **Findings and Recommendations**

This report has surveyed the energy efficiency landscape in Colorado. Here are the most significant findings:

- Attaining the governor's Climate Action Plan goal for carbon reduction relies on substantial levels of utility DSM: 6,725 GWh of savings by 2020.
- When the 6,725 GWh goal is apportioned among all of Colorado's electric utilities, it is apparent that most the electric utilities in the state must continue to increase their efforts if the overall goal is to be achieved.
- DSM operates in a changing marketplace, due mainly to new federal initiatives. In the near term (2010-2012) the market will experience an increase in financial incentives due to ARRA funding. In the longer term, the impact of changing building and appliance codes and other government-initiated market transformation efforts will compete with DSM, requiring new DSM strategies.
- In order to achieve the DSM and carbon reduction goals, utilities need to respond quickly and creatively to the changing market conditions. The Commission needs to assure that its rules and decisions are not impeding quick and creative responses.

The following pages present the Commission's recommended actions in response to the findings of this report. These recommendations address primarily the utilities regulated by the Commission, especially as they prepare DSM plans to be filed in 2010. The Commission also recognizes areas where it can take initiative to promote effective DSM planning, and those are noted below as well.

The Commission is also acutely aware of the impact that other key stakeholders, particularly the Governor's Energy Office, will have upon the long-term success of statewide energy efficiency initiatives. Suggestions concerning how regulated utilities can best coordinate with GEO are also noted below.

Finally the State Legislature requested that the Commission recommend statutory changes concerning DSM.<sup>14</sup> This section concludes by addressing that request.

### **Regulated Utility DSM Planning**

According to Commission Rules<sup>15</sup> gas utility DSM plans for 2011-2013 are to be filed with the Commission by May 1, 2010. This applies to Atmos Energy, Colorado Natural Gas, Eastern Colorado Utility, Public Service Company (filing a joint gas/electric DSM plan) and SourceGas. Black Hills Energy will file a gas DSM application within 60 days of the effective date of Commission revisions to the current gas DSM rules.<sup>16</sup> Black Hills is now implementing an electric DSM plan approved through June 30, 2012.<sup>17</sup> A subsequent electric DSM plan filing from Black Hills is not anticipated until the third quarter of 2011.

This next round of DSM plan filings in 2010 provides utilities and the Commission an opportunity to respond creatively and effectively to the changing circumstances in which DSM is operating. Toward that objective, the Commission will direct regulated electric and gas utilities to undertake the following actions:

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<sup>14</sup> *see* §40-3.2-105, C.R.S.

<sup>15</sup> Section 4752 (c), 4-CCR 723-4

<sup>16</sup> *See* paragraph 18 of Decision No. R09-0371 concerning the filing timetable and Decision C09-1066 concerning revision of the current gas DSM rule.

<sup>17</sup> *See* paragraph 35 of Decision No. R09-0542

- Coordinate with GEO on all aspects of utility DSM program design and implementation that are affected by GEO's initiatives, to the fullest extent practical. Specifically:
  - For 2010: since most DSM plans have already been approved, substantial changes to program design (rebate levels, marketing strategies, etc.) may not be feasible. Utilities are encouraged to use 2010 to begin testing increased collaboration with GEO on the use of incentives, marketing and rebate processing.
  - For 2011-2013: Utilities should include any government-provided<sup>18</sup> incentives in updated market assessments and show how program strategies (incentive levels, marketing, administrative collaboration) were revised accordingly. In setting incentive levels, the utilities should address how ratepayer-funded DSM programs act to minimize free ridership. Also the utilities shall address how to best sustain a service delivery infrastructure after ARRA funds are depleted.
  
- Demonstrate how portfolios have been revised to attain 2020 DSM goals given the changing landscape of federal efficiency standards. Plans that currently rely heavily upon conversion of incandescent lighting to CFLs need to factor into DSM portfolios the impact of changes in federal lighting standards scheduled to take effect in 2012.
  
- Address the impact of other market transformation efforts (building codes, appliance standards, financing options, etc.) on DSM programs. Address how DSM programs can reinforce the changes in codes and standards, increasing the speed of public adoption and continuing the momentum. Also, consider shifting portfolios away from incentive-based initiatives (rebates, etc.) to market transformation strategies. This could also include redirecting some DSM resources into making financing more accessible and affordable.<sup>19</sup> Also include recommended methods for quantifying the impacts of market transformation initiatives, so that utility performance incentives can appropriately acknowledge these efforts.

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<sup>18</sup> The ARRA funds are likely to yield new incentives not only through GEO but also local governments receiving direct allocations of ARRA funds.

<sup>19</sup> For example, it may be more cost-effective to provide innovative mortgage refinancing than providing bundled rebate incentives to existing homeowners (or possibly a combination of financing and reduced rebate incentives).



- Concerning low-income energy efficiency, particularly single-family weatherization: since this area will receive such a substantial increase in funding relative to existing governmental and utility DSM funding, utilities are encouraged to negotiate with GEO on the deferral of DSM funding for the period starting in 2010 and continuing until the ARRA funds have been exhausted. Include in this negotiation the effective transition of the weatherization infrastructure from its peak funding to a post-ARRA level of funding in 2012 or 2013. Since this will likely affect current DSM plans, inform the Commission of agreements reached with GEO concerning funding deferrals.

### **Commission Regulation of DSM**

- Incorporate energy efficiency (DSM) explicitly into PUC deliberations concerning all applications for Certificates of Public Convenience and Necessity; revise rules as necessary to include an assessment of how the “necessity” has first addressed all cost effective energy efficiency opportunities.
- Invite Tri-State Generation and Transmission to present its existing DSM Market Potential Study findings to the Commission
- Determine if any gas DSM rules or Commission Decisions are impeding utilities from fully coordinating with GEO-ARRA initiatives or otherwise impeding responsive and creativity; pursue waivers or amended Decisions, as necessary. Assist utilities and GEO in determining how to best coordinate energy efficiency incentives; striving to balance all of the following:
  - assure that ratepayer funds are used cost effectively;
  - maintain approved DSM financial incentives;
  - encourage maximum consumer participation; and
- Explore how to best incorporate market transformation efforts into quantitative analysis of DSM performance and related incentive bonus calculations.

## **Coordination of Utility DSM with GEO Energy Efficiency Initiatives**

The Governor's Energy Office, with its range of energy efficiency initiatives and ARRA funding, will play a critical role in the development of a statewide, cohesive energy efficiency strategy. As GEO further develops and implements its plans, the Commission encourages the following:

- That GEO continue developing financial incentive plans cognizant of the impact upon utility DSM programs. For example, anticipate that updated utility DSM plans (for 2011-2013) will likely include rebate levels lower than 2009-2010 levels. Work proactively with utilities (and with the assistance of PUC staff) to determine how to communicate changing rebate levels into the market so as to minimize consumer confusion and maximize participation.
- Explore how utility DSM programs can be partners to GEO market transformation strategies (upgrading building codes through training and enforcement; improving minimum appliance standards; designing alternative energy efficiency financing mechanisms).
- Working in collaboration with PUC staff, establish and convene a working group comprised of all key stakeholders: all utilities currently implementing DSM plans; OCC; DSM resource organizations. Use the working group to share information, coordinate and harmonize program design where appropriate, and discuss additional collaboration opportunities.

## **Establishing Statewide Energy Efficiency Policy and Practices**

In the DSM statute enacted in 2007 the General Assembly requested of the Commission recommended statutory changes concerning DSM.<sup>20</sup> As noted in this report, the Commission has fully implemented the DSM statute and all regulated electric and gas utilities are now implementing DSM programs.

The Commission's experience overseeing DSM implementation in the investor-owned segment of the utility markets offers insights for the General Assembly. As also noted in this report DSM is absent or insignificant in several portions of the municipal and rural electric sectors. Achieving a statewide commitment to DSM is beyond the purview of the Commission; yet, it may be a policy that the legislature desires to address as part of achieving the governor's Climate Action Plan goals.

The Public Utilities Commission has new insights into how to effectively incorporate DSM in electric resource planning as well as the role of providing the utility with financial incentives sufficient to make DSM a component of the for-profit utility business model. While aware that these lessons do not directly transfer into the municipal and rural electric sectors, they can be a resource for exploring policy options appropriate for these sectors. The cooperatives and several municipal utilities also have a depth of experience to offer into this discussion. The Commission offers itself as a resource to the legislature in these endeavors.

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<sup>20</sup> See §40-3.2-105, C.R.S.

## APPENDIX A

Chart 2 is based upon the following data.

### Quantifying the DSM Goal within the Climate Action Plan (Source: Governor’s Energy Office)

Total number of GWh needing to be avoided through DSM to meet Climate Action Plan Goal: 6,725 GWh

### Apportioning the 6,725 GWh among various utilities and sectors in Colorado:

(Source Energy Information Administration; 2007 electric utility sales data.

<http://www.eia.doe.gov/cneaf/electricity/esr/table10.xls>)

<b>Utility/Sector</b>	<b>Total 2007 Sales (MWh)</b>	<b>Percentage of Total Colorado Sales</b>	<b>Portion of 6,725 GWh CAP goal</b>
City of Colorado Springs	4,582,094	9.0%	605
City of Ft. Collins	1,442,861	2.8%	190
Other PRPA municipal utilities	1,593,224	3.1%	210
Rural Electric Cooperatives served through Tri-State G&T	7,588,489	14.9%	1,002
All Other Rural Electric Cooperatives	4,542,610	8.9%	600
Black Hills Energy	1,849,205	3.6%	244
Public Service Co. of Colorado	28,085,887	55.1%	3708
Totals:	50,944,401	100%	6,726

PRPA = Platte River Power Authority

The “other PRPA utilities” pertains to Estes Park, Longmont and Loveland municipal utilities. These three municipal utilities, along with Tri-State G & T, budget for energy efficiency programs, yet, do not report savings goals. For purposes of statewide comparison, a DSM value was calculated for these budgets. This was done using data available from the Public Service Co. of Colorado 2009-2010 DSM Plan. Specifically, from the PSCo plan a value for the first year energy savings value was calculated at \$0.289/kWh. This value was divided into each energy efficiency budget to yield first year energy savings. These savings were then multiplied by 12 to cover the period from 2009 to 2020. The 2009 energy efficiency budget values used for this calculation were:

The total PRPA funding for DSM is \$1.9 million. Of this total, \$1.1 million is allocated to Ft. Collins, yielding \$800,000 for Estes Park, Longmont and Loveland combined.

Tri-State G & T has budgeted \$2,500,000 for energy efficiency in 2009. That amount does not include additional funds budgeted by individual member coops. The exact amount of additional funding amongst the 18 member coops is not known, yet, could be as much as 50-100 percent of the Tri-State budget.

It is noted that Holy Cross Energy offers rebates to its members associated with the purchase of energy efficiency appliances. This does not have a specific budget, but is part of a larger group of services and rebates available to members. Thus, no DSM value was derived for Holy Cross.

The 2008 Electric Integrated Resource Plan (EIRP) issued by Colorado Springs Utilities (CSU) states that their preferred scenario includes "high DSM" which would result in 333 GWh/yr of savings in 2020 from cumulative programs. (See Appendix 1 of the 2008 EIRP.) The 450 GWh/yr number presented in this report represents the savings that would result if CSU was to raise the goal to 10% savings by 2018. This target of 10% savings is (approximately) the goal targeted by Xcel and Black Hills' DSM programs.

Ten Largest Retail Electric Providers in Colorado (2007 EIA sales data).  
 Represents 94.6% of all sales in Colorado.

Utility/Segment	2007 MWh Sales	Percent of State
Public Service Co. of Colorado	28,085,887	55.1
18 Colorado-based cooperatives (Members of Tri-State Generation and Transmission)	7,588,489	14.9
City of Colorado Springs	4,582,094	9.0
Intermountain Rural Electric Association	2,095,309	4.1
Black Hills Energy	1,849,205	3.6
City of Ft. Collins	1,442,861	2.8
City of Longmont	813,584	1.6
City of Loveland	654,302	1.3
Moon Lake Electric Association	558,660	1.1
Yampa Valley Electric Association	554,700	1.1

## APPENDIX B:

### **CAP Non-Utility Initiatives Affecting the Energy Efficiency Market**

(This information was prepared for the Colorado Public Utilities Commission by the Southwest Energy Efficiency Project)

The following are explanations of the four non-utility initiatives identified in the Climate Action Plan, and presented in Chart 6.

#### **Updating Building Energy Codes**

It is estimated that approximately 590,000 new homes will be built in Colorado during 2007-2020, or about 42,000 per year on average (Dunn 2007). This is the same as the average rate of home construction in the state during 2000-2008 based on the number of building permits that were issued.<sup>21</sup> Likewise, a considerable amount of commercial floor space will be built or renovated between now and 2020. Colorado is a home rule state, but House Bill 07-1146 requires all local jurisdictions with building codes to adopt the 2003 International Energy Conservation Code (IECC), or better. It also allows GEO to establish a more stringent code as the floor for local energy codes in the future. Following the adoption of this legislation, GEO promoted and many jurisdictions in the state adopted the 2006 version of the IECC.

In 2009, the International Codes Council published a new version of the model energy code, the 2009 IECC. A detailed analysis of the 2009 IECC indicates it will lead to 10-12% energy savings in new homes, relative to homes just meeting the 2006 IECC, in the Colorado climate zones (EECC 2009). GEO has begun to promote the adoption of the 2009 IECC, and many key jurisdictions including Denver and surrounding municipalities are working on adopting this new model code. In addition, the model energy code is typically updated on a three-year schedule; i.e., the next update is expected to be published in 2010 or 2011, and will take effect in 2012.

#### **Increased Federal Lamp Standards**

Federal efficiency standards including the light bulb standards in the 2007 EISA and the lighting standards recently issued by the U.S. DOE will also have an impact on utility efficiency programs, in particular by reducing the opportunities for energy savings that utilities can promote and take credit before. The potential impact upon BHE and PSCo's Electric DSM Plans was discussed in the previous section. The next section discusses how some utilities are preparing for these federal standards taking effect and are working on plans for maintaining high levels of DSM program savings (i.e., in excess of 1% savings per year) without taking credit for any savings from ordinary compact fluorescent lights (CFLs) once the federal standards take effect.

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<sup>21</sup> See <http://www.census.gov/const/www/C40/annualhistorybystate.pdf> for details.

## **Industrial Challenge Program**

The CAP calls for an industrial energy efficiency program. GEO, with financial support from the U.S. Department of Energy, is planning to launch a program whereby industries are called upon to make voluntary commitments to reduce their energy intensity, including pledging to audit facilities and implement cost-effective energy efficiency projects. Technical assistance would be offered to companies that request it; and recognition and annual awards would be given to outstanding companies. This program is expected to be launched later fall. Initial funding is for a three-year period.

## **Greening State Government**<sup>22</sup>

In April, 2007 Governor Bill Ritter, Jr., signed the Greening of State Government Executive Orders D011 07 and D012 07. These orders charge state departments, agencies and offices to take a position of leadership in the new energy economy. State government will reduce energy consumption, increase the use of renewable energy sources, increase the energy efficiency and decrease the environmental impact of the state vehicle fleet, implement environmental purchasing standards and reduce waste and increase recycling.

Greening Government enables State employees to take a position of leadership in the New Energy Economy through energy conservation and efficiency, thereby reducing the environmental impact of state operations. The Greening Government goals, to be achieved by June 30, 2012 include a 20% reduction in energy use and a 25% volumetric reduction in state vehicle petroleum consumption.

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<sup>22</sup> Noted in the CAP; energy savings not estimated by SWEEP.



## APPENDIX C:

(This information was prepared for the Colorado Public Utilities Commission by the Southwest Energy Efficiency Project)

### **Responding to the Changing Conditions: Lessons from Other States**

Many utilities are starting to explore ways to maintain high levels of energy savings in 2012 when the federal standards on light bulbs start to take effect. It is likely that utilities will no longer be promoting and taking any credit for energy savings from regular CFLs once the federal standards fully take effect. However, it is important to remember that the federal standards are performance based; i.e., they require minimum lumens per watt, they do not prohibit sale of incandescent lamps. Philips and other manufactures are developing improved incandescent lamps that are designed to meet the federal standards in phase one which go into effect during 2012-2014. So there still may be an opportunity for utilities to promote CFLs through cost-effective DSM programs in 2012 and beyond if it turns out that there is a large market for these improved incandescent lamps; (CFLs will still provide at least 50% electricity savings compared to the improved incandescents). Phase two of the federal standards takes effect in 2020 and this standard is much higher than the Phase one standards. It is reasonable to assume that the Phase two standard can only be met by CFLs or light-emitting diodes (LEDs).

Some utilities have prepared (or are preparing) DSM plans that include programs for 2012. One example is the 2010-2012 DSM plan recently prepared by Nevada Power Co. (Nevada Energy 2009).<sup>23</sup> This utility is still ramping up DSM programs and expects to save about 1.3% of its sales in 2010 and 2011 when ordinary CFLs are still a big part of its overall set of DSM programs. But the utility is expanding many other programs in this period as well. In 2012, the utility still expects to save about 1.0% of its sales when it is assuming it will no longer be providing incentives for or achieving energy savings from ordinary CFLs. The types of programs the utility plans to implement to achieve this level of savings in 2012 are as follows:

Program	Portion of 2012 Energy Savings (%)
Commercial retrofit	35.2
Commercial new construction	10.9
Demand response	10.4
Residential lighting <sup>24</sup>	9.4
Residential high efficiency AC	9.1
Energy Plus new homes <sup>25</sup>	6.0
Second refrigerator recycling	5.2
In home energy displays	4.6
Other	9.2

<sup>23</sup> The new Nevada Power DSM Plan was submitted to the Nevada PUC as part of a new IRP on July 1, but was subsequently withdrawn due to the PUC rejecting the load forecast that was used as the basis for the IRP. As a result Nevada Power will resubmit the IRP and thus the DSM Plan by December 1, 2009. The DSM Plan is not likely to change, or will change in only minor ways, according to the head of DSM programs for the utility.

<sup>24</sup> The 2012 lighting program will promote specialty CFLs, next generation CFLs, and LED lamps

<sup>25</sup> New homes that are at least 15% more efficient than ENERGY STAR homes

It is also worth noting that other utilities in the region are planning to significantly ramp up DSM programs over the next few years as well. In particular, Arizona Public Service Company recently submitted a settlement proposal to the Arizona Corporations Commission that calls for APS saving 1% of its sales in 2010, 1.25% in 2011, and 1.5% in 2012 as a result of DSM programs implemented each of these years (APS 2009). CFLs provided 65% of the total energy savings in its original DSM plan for 2005-2007. The APS 2010 implementation plan shows consumer products program (which are mostly but not all CFLs) providing 40% of total energy savings. The number of programs and number of measures has expanded in recent years, including: appliance recycling; Home Performance with ENERGY STAR; a higher tier for very efficient new homes; new rebates for attic insulation and solar screens; a financing option for schools, municipalities, and small business; a large customer self-directed option; and direct install components all being added in 2010.

### **Lessons from Other States: Utility DSM and Market Transformation**

Most electric utilities with comprehensive and well-funded energy efficiency programs are striving to meet ambitious energy savings goals or requirements. Increasingly DSM or energy efficiency (EE) is considered “resource acquisition” for resource planning purposes. While DSM is becoming part of resource planning, the urgency and demand for substantive and quantifiable energy savings often limits the interest of utilities in explicitly promoting market transformation (MT) strategies. Contrary to traditional DSM, MT strategies build toward market conditions where energy efficiency will occur “on its own” and not as a result of continued utility marketing and financial incentives. The distinction is not always this black and white. Particularly in states with relatively long DSM histories, utility DSM programs often incorporate market transformation strategies, as discussed in more detail below.

Some utilities are acting in ways that support market transformation as well as EE resource acquisition. These activities include educating consumers about energy savings opportunities and the benefits of implementing EE measures; training builders, contractors and other energy professionals about topics such as energy-efficient design, or proper installation of energy efficiency measures; and testing and demonstrating emerging or prototype technologies. In addition, some utilities are supporting the adoption of more stringent energy codes and standards, policies that by their very nature contribute to market transformation.

Analyzing spillover effect (along with free-ridership) is a common way of looking at the broader market effects of particular DSM programs. Spillover effect can involve additional investment in efficiency measures by either program participants or non-participants. Spillover effect is normally considered in the evaluation of net program impacts in a number of states that have well-funded, comprehensive ratepayer-funded efficiency programs; e.g., in California, Northeast and Northwest states, and Wisconsin (Reed, Galvin, and Hamilton 2006). Methods for analyzing market transformation and spillover effect are addressed in energy efficiency program evaluation manuals and guidelines, such as the widely used California Evaluation Framework (TecMarket Works Framework Team 2004).

Although it is challenging to do with any sort of accuracy, there are examples of quantitative analysis of the energy savings and cost effectiveness of education and training programs. Green and Skumatz (2000) provide a literature review of such evaluations during the 1990s. More recently, program evaluation specialists have analyzed the savings associated with implementing the Building Operators Certification (BOC) training in Northeast states (RLW Analytics 2005) and also the U.S. DOE-sponsored Compressed Air Challenge (CAC) training (LBNL and Xenergy, Inc. 2004).

The California Statewide Codes and Standards Program (C&S Program) is a prime example of utilities working to improve codes and standards. This program, implemented by CA's investor-owned utilities at an annual budget of about \$5 million per year, makes recommendations and provides technical analysis to support strengthening of both state appliance efficiency standards and the state's building energy codes. The Program is considered to be very effective. One study estimated that the program's impact on 2001 codes and standards produced energy savings for the utilities at an average cost of saved energy of about \$0.001/kWh and \$0.25/therm, far less than the average cost of saved energy from other electric and gas utility DSM programs (Stone et al. 2002). However, it is difficult to determine attribution and quantitatively estimate the amount of energy savings that results from efforts such as the C&S Program. The estimates referred to above assume the utilities are responsible for 20% of the energy savings in the 2001 code and standards upgrade cycle, but this is only a rough guess.

The California C&S program is also striving to improve compliance with building energy codes and appliance standards. This is done through education and training of builders, contractors, and building code officials in the case of energy codes, and education and outreach activities to appliance industry market actors in the case of appliance standards. It is estimated that these education and training activities save electricity at a cost to the utilities of about \$0.01/kWh. But as PG&E staff and consultants note, standards education and training benefits are difficult to value (Eilert et al. 2008).

Utilities contribute to market transformation in other ways including through education of consumers about the availability and benefits of energy-efficient products; e.g., ENERGY STAR appliances. Econometric studies have been carried out using time series models to examine the longer term market transformation effects of utility DSM programs and other efforts such as the federal Green Lights program (now discontinued) and the ENERGY STAR programs. For example, Horowitz (2001) found that utility DSM programs and the Green Lights program together had a significant, synergistic impact on the shift to electronic ballasts for fluorescent lamps nationwide. Likewise Tiedemann (2007) found that utility DSM programs in CA increased sales of ENERGY STAR appliances even after the programs ended. However, these longer term market impacts are usually not included in the energy savings attributed to DSM programs for the purpose of meeting state energy savings goals or requirements.

In some regions of the country, utilities and other organizations work on market transformation jointly through a regional energy efficiency organization. The work of the Northwest Energy Efficiency Alliance (NEEA) is a prime example of this type of collaboration. NEEA is a non-profit organization that works with manufacturers, distributors, and service providers to increase the availability and affordability of energy-efficient products and services. NEEA's annual budget is about \$20 million per year with most of this provided by BPA and electric utilities in

the region. Some examples of NEEA programs include increasing the availability and consumer awareness of efficient lighting products and appliances; providing certification, labeling and marketing to increase the market share for ENERGY STAR new homes; providing design tools, technical assistance, and education activities aimed at increasing the adoption of high performance commercial buildings; and support for energy codes and standards. Third party evaluation concluded that NEEA programs implemented during 2005-2007 saved about 400 GWh/yr with a levelized cost of saved energy of only \$0.005/kWh (NEEA 2008). These savings are in addition to savings realized through other utility or third party administered efficiency programs in the region.

There are examples where a combination of statewide and utility-based energy efficiency programs have been implemented in order to maximize impacts in the marketplace. This has occurred in Wisconsin, for example. In this case energy savings were split according to each party's contribution to total program costs. Also, experience in Wisconsin demonstrated that collaboration among program implementers was much preferred to competition, and that shorter term resource acquisition efforts can support longer term market transformation (Kuntz, Carroll, and Brandt 2006).

A recent Commission Decision from the California PUC<sup>26</sup> outlines the next generation in California regulatory practice concerning market transformation. At issue is how to effectively quantify market transformation so that it can fit into the DSM regulatory structure. This Decision states:

“In order to track market transformation, it is necessary to track market conditions. The results of the program performance metrics can then be compared with the market data to determine the relative success of the programs.” (Section 4.6.3, Market Transformation Metrics)

The draft Decision finds that “it would be premature to adopt metrics in this decision. Therefore, in this decision we set forth the principles and the process for the development of a system to measure and monitor market transformation efforts.”<sup>27</sup> The CA PUC contends that both “ultimate” and “proximate” metrics that indicate market change are warranted. These terms are defined in the draft order as:

Ultimate indicators: “indicators of structural changes in the patterns of adoption of the technology or behavior change, which should related closely to key barriers that need to be overcome. Examples of ultimate indicators are: market share and sales; saturation and prevalence of practices; changes in codes & standards; and, adoption of technology or practice as common practice.”

Proximate indicators: “indicators that are necessary as preconditions for increases in ultimate indicators. Examples of proximate indicators include: awareness and

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<sup>26</sup> *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets*  
[http://docs.cpuc.ca.gov/PUBLISHED/AGENDA\\_DECISION/107378.htm](http://docs.cpuc.ca.gov/PUBLISHED/AGENDA_DECISION/107378.htm)

<sup>27</sup> *Ibid*, p. 79

knowledge; attitudes/beliefs/acceptance; availability; trade ally promotional efforts; and, incremental cost.”

Concerning the “Process for Developing Market Transformation Metrics” (Section 4.6.3.3 of the Decision), the CA PUC states that the “market transformation metrics require the identification of indicators to track, the identification of data sources, and agreement on the frequency of the data collection, analysis and use.” The Decision also finds that “it is appropriate that such indicators are ultimately adopted by the Commission” and directs the Energy Division of the CA PUC to develop recommended market transformation indicators, gathering the input of “market actors” in the process. The Decision also directs the utilities to include key data sources and indicators in their filings.

The draft Decision also discusses the use of market transformation metrics to determine when DSM programs should be phased out, yet, that this must be applied on a case-by-case basis. (*See* Section 4.6.3.4 of the draft Decision.) As a step in this direction, the Decision orders utilities to include in their DSM applications the “rationale for continuing (a DSM) measure and supporting material for each significant portfolio-level efficiency measure that they believe has not yet achieved market transformation”.<sup>28</sup>

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<sup>28</sup> Ibid, p. 82

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Report compiled by:

Jeffrey Ackermann  
Policy Advisor to the Commissioners  
Colorado Public Utilities Commission  
1560 Broadway, Suite 250  
Denver, CO 80202

303-894-2856

[jeffrey.ackermann@dora.state.co.us](mailto:jeffrey.ackermann@dora.state.co.us)

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